HORIZONTAL MILLING-BORING MACHINE WITH MOBILE COLUMN

The present invention relates to a horizontal milling-boring machine with mobile column.

Milling machines of mobile column type are known comprising a horizontal bed anchored to the floor, a column carriage horizontally slidable along said bed, a column structure supported by said carriage, a slide carriage slidable vertically along said column structure, a slide slidable horizontally along said carriage in a direction perpendicular to the longitudinal axis of said bed, and a spindle head mounted on the end of said slide and facing a work table to which the workpiece to be machined is fixed.

A recurrent problem in these milling machines consists of the fact that the bed and the column carriage result in an excessive height of the spindle axis from the work table, this being a serious impediment both to accessibility and visibility of the workpiece being machined, especially for tall regions of the workpiece.

To overcome this drawback it has already been proposed to anchor the bed to the bottom of a pit previously made in the floor of the room in which the machine is to be installed, and to anchor the work table to the floor, parallel to said pit.

By virtue of this solution it has been possible to set the spindle axis in a lower vertical position very close to the work table and in certain cases even below it. At the same time this known solution has also resulted in certain drawbacks, and in particular:

- cost: considering that a pit can have a depth of 2 metres, a width of 4 metres and a length of 15 metres, it is immediately apparent that a pit requires excavation work of more than one hundred cubic metres, a lining

for the bottom and side walls of the pit which is impermeable to the refrigeration and lubrication liquids normally used during machining, walkways for operator movement in proximity to the machine and/or workpiece, a conveyor for machining swarf and chippings, located in the bottom of the pit, a tray provided in the bottom of the pit for collecting said refrigeration and lubrication liquids, and a bilge pump for transferring the liquids from the tray to the main machine tank;

- limited safety because of the presence of the pit: this drawback means that fixed or movable barriers must be used, able to protect only personnel in transit not involved in the machining, but ineffective for the operators who, because of the presence of control members in the machine, have to work within the barrier-protected areas;
- the fact that the installation area is suitable only for this exclusive use; in reality, the pit could always be filled in and the floor of the room in which the machine was installed be restored, however this would involve considerable difficulties and high costs for remaking the floor, and for repeating the operations involved in forming a new pit in a different area.

An object of the invention is to solve this problem by making it possible to install in particular a horizontal milling-boring machine without requiring excavation work, but at the same time such that the spindle axis lies very close to the machine work table.

This and further objects which will be apparent from the ensuing description are attained, according to the invention, by a horizontal milling-boring machine with mobile column as claimed in claim 1.

The preferred embodiments of the present invention are described in detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 is an overall schematic perspective view of a first embodiment of a milling-boring machine according to the invention,

Figure 2 shows it in the side view II-II of Figure 1,

Figure 3 shows it in the view III-III of Figure 2,

Figure 4 shows it in plan view,

Figure 5 shows a second embodiment thereof in the same perspective view as Figure 1,

Figure 6 shows it in the side view VI-VI of Figure 5,

Figure 7 shows it in the view VII-VII of Figure 6,

Figure 8 shows it in plan view,

Figure 9 shows a third embodiment thereof in the same perspective view as Figure 1,

Figure 10 shows it in the side view X-X of Figure 9,

Figure 11 shows it in the view XI-XI of Figure 10, and

Figure 12 shows it in plan view.

As can be seen from Figures 1-4, a first embodiment of the milling-boring machine of the invention is essentially a machine of known mobile column type, i.e. with a horizontal slide 2 movable axially and also movable vertically along a column structure 4, which itself is movable horizontally in a direction perpendicular to the axis of the slide 2, along a bed 6 anchored to the floor 8.

More specifically, not only the bed 6 is anchored to the floor 8 but also a work table 10 separated from the bed and provided with grooves 12, on which the workpiece 14 to be machined can be fixed in traditional manner.

The column structure 4 is of symmetrical portal type and comprises a pair of columns 16, which are joined together upperly by a crosspiece 18 and are prolonged lowerly into a pair of portions 19, the function of which is to support the column structure on the bed 6 in a stabilized manner.

A carriage 22 supporting and axially guiding the slide 2 is slidable vertically along the facing inner walls of the columns 16. As the systems for vertically driving said carriage 22 are traditional, they do not require a more detailed description.

As stated, the carriage 22 supports the slide 2 and is provided with traditional members for guiding and driving this latter in an axial direction, i.e. in a horizontal direction perpendicular to the axis of the bed 6.

The vertical movement of the carriage 22 along the column structure 4 involves the entire inner opening of the column structure, bounded upperly by the crosspiece 18 and lowerly by the upper surface of the bed 6 or by a thin connection between the two columns 16.

The column structure 4 slides along the bed 6 on guides 26, which can be positioned between the upper surface of the bed 6 and the lower surface of the column structure 4 (see Figure 2).

Likewise, the traditional members for driving the column structure along the bed 6 can consist of a male-female screw combination 28 positioned on the upper surface of the bed 6, or a linear electric motor, or

can consist of a pinion 30/rack 32 combination positioned on the upper surface of the bed 6 or on a lateral surface of the bed 6.

The aforedescribed machine is provided with traditional control systems enabling the tool head 34, mounted at that end of the slide 2 facing the work table 10, to undergo movement in accordance with the desired machining program which the machine has to carry out on the workpiece 14 positioned on the work table.

From the aforegoing it is apparent that the milling-boring machine of the invention is particularly advantageous compared with traditional machines, and in particular enables the spindle axis to reach a position very close to the work table 10 without the bed 6 having to be installed in a pit, and hence without requiring laborious and costly excavation work.

In the embodiment shown in Figures 5-8 in which corresponding parts are indicated by the same reference numerals, the bed 6 comprises a wide longitudinal recess 36 defining two longitudinal projections 38, on the upper surface of which the guides 26 are applied. Correspondingly, each of the two lower portions 19 of the columns 16 is provided with a lower appendix 40 intended to slide along the longitudinal recess 36 of the bed 6. The two appendices can be advantageously joined together by a connecting and stiffening portion, also housed slidable within the longitudinal recess 36.

This second embodiment achieves the same advantages as the preceding, in addition to further lessening the column dimensions and enabling the rails 26 to be positioned between the facing lateral surfaces of the longitudinal recess 36 and of the appendices 40.

In the third embodiment shown in Figures 9-12, in which corresponding parts are indicated by the same reference numerals, the two columns 16 of the portal column structure 4 are joined together by a pair of lower crosspieces 20, which extend downwards to externally embrace the two sides of the bed 6. These two lower crosspieces 20 define a portion positioned outside the corresponding side of the bed and extending upperly to join the two columns 16.

This third embodiment adds to the advantages of the preceding a greater robustness and a greater ease of construction while, as in the case of the second embodiment, enabling the guide rail 26 to be interposed between outer lateral surfaces of the bed 6 and the facing lateral surfaces of the lower crosspieces 20.